REMARKS

Applicants respectfully request reconsideration and allowance of the pending claims.

I. Status of the Claims

Upon entry of this amendment, claims 30-33, 34, 36-38, 40-51, and 53-55 remain pending. Claims 56-62 have been added, while claims 35, 39, and 52 have been canceled. Accordingly, claims 30-33, 34, 36-38, 40-51, and 53-62 are pending.

Claims 30, 33, 34, 40, 44, 45, 50, and 53 have been amended. Applicants' specification at [0011] supports the amendment to claims 30, 40, and 53 with regard to the pH less than about 1. Applicants' specification at [0022] supports the amendment to claims 30, 40, and 53 with regard to the oxidation inhibitor. Applicants' specification at [0024] supports the amendment to claims 30, 40, and 53 with regard to the ratio of tin ions to copper ions. Applicants' specification at [0024] supports the amendment to claim 30 with regard to plating a bronze having a copper content greater than about 60%. Applicants' specification at [0022] supports the amendments to claims 30, 44. All other amendments have been made to further clarify the claims.

Applicants' specification at [0024] supports new claims 56-58. Applicants' specification at [0011] supports new claims 56-59. Applicants' specification at [0014] supports new claim 60-62.

II. Specification

In response to the objection to the specification because of informalities, applicants request correction as shown starting at page 2 of this Amendment. Moreover, applicants

request correction of an obvious typographical error to [0014]. Support for the amendment to [0014] may be found in the original EP application No. 02022718.7.

III. Objections to the Claims

In response to the objections to claims 33-34, 44-45, and 48, applicants amended claims 30 and 40 to replace the transition "containing" with the transition "comprising." Applicants chose to amend claims 30 and 40 (rather than the other claims) because "comprising" has a well-known meaning in patent literature. See MPEP §2111.3, second paragraph. The amendments also render the use of "comprising" in still pending claims 34, 45, and 48 consistent with claims 30 and 40. Moreover, claims 33 and 44 have been amended to remove the "comprising" transition.

IV. Claim Rejections Under 35 U.S.C. §112, second paragraph

In response to the rejection of claim 30 with regard to the second use of the phrase "a substrate," claim 30 has been amended to use the phrase "the substrate."

In response to the rejection of claims 30-39 for omitting essential steps, claim 30 has been amended to include the step of applying a current to electrolytically deposit a bronze.

V. Double Patenting

The pending claims are provisionally rejected on the ground of non-statutory obviousness-type double patenting as being unpatentable over claims 1-27 of co-pending application Ser. No. 11/105,947. Unless and until the copending application matures into a patent, however, the appropriateness of such a rejection cannot be ascertained. Applicant will consider filing a

terminal disclaimer to obviate this rejection when the application is in condition for allowance.

VI. Claim Rejections Under 35 U.S.C. §§102(b)/103(a)

A. Claims 30-39

Reconsideration is requested of the rejection of claim 30-39 as being anticipated by or obvious over EP 1,001,054 (referred to herein as "Yanada et al.").

(1) The Claimed Invention

Claim 30 is directed to a method for electrolytic deposition of bronze onto a substrate. In relevant part, the method comprises immersing the substrate into an aqueous acidic electrolyte having the following characteristics:

(1) a pH less than about 1;
(2) a composition comprising:
  a) tin ions;
  b) copper ions;
  c) an alkylsulfonic acid;
  d) an aromatic, nonionic wetting agent; and
  e) an oxidation inhibitor; and
(3) a ratio of tin ion concentration to copper ion concentration is sufficient to electrolytically deposit a bronze having a copper content of greater than about 60%.

Accordingly, claim 30 is directed to a method for plating a bronze having a high (>60%) copper content. The method employs a strongly acidic bath comprising a particular wetting agent, acid, and oxidation inhibitor. The high copper bronze is useful in decorative applications. See applicants' specification at [0007] and [0023].

(2) Yanada et al.

Yanada et al. disclose a method for plating a tin-copper alloy that is "useful as a substitute for tin-lead alloy

(solder) plating." See [0001], emphasis added. Their solder is useful for plating over various electronic and microelectronic substrates prior to a soldering operation. See [0002]. Although Yanada et al. state at [0050] "[t]ypically the tin-copper alloy consisting of...0.01 to 90 wt% of copper...," the alloys they demonstrate have a *low* copper content. The alloy with the highest copper content was deposited from the bath of Example 8 and contained only 22 wt% copper. See also [0016], where Yanada et al. disclose copper ion and tin ion concentrations for "obtaining a tin-copper alloy deposit containing 0.01-30 wt% of copper..."

A primary goal in solder formulation is to maintain a low melting point. This explains why all Yanada et al.'s formulations have a low copper content (less than 30%). In particular, copper has a melting point of about 1083°C.[1] Thus, high copper concentrations increase the melting point of the tin-copper alloy, which is undesirable in the solder alloy field. The copper content is kept low so the melting point is kept low, and therefore joining can occur without damaging the substrate. Accordingly, Yanada et al.'s electrolytic plating solutions contained a much higher tin ion concentration than copper ion concentration. Note all of their examples. Even Yanada et al.'s Example 8 contained four times as much tin ion as copper ion.

(3) Anticipation

The disclosure of Yanada et al. does not anticipate claim 30 because Yanada et al. do not teach or suggest all of the claim limitations. See MPEP §2131. For example, claim 30

[1] See http://www.sigmaaldrich.com/catalog/search/ProductDetail/FLUKA/61142 for copper's melting point. Compare this to tin's melting point of only about 232°C. See http://www.sigmaaldrich.com/catalog/search/ProductDetail/ALDRICH/265659.

requires a ratio of tin ions to copper ions sufficient to deposit a bronze having at least 60% Cu. Yanada et al. do not disclose any plating bath having a ratio which satisfies this requirement. While Yanada et al. do state broadly at [0050] that an alloy having from 0.01 to 90 wt% copper depends "on the ratio of tin ions and copper ions in the plating bath," nowhere do they disclose any concentration of tin ions, any concentration of copper ions, or any ratio thereof to yield "a ratio of tin ion concentration to copper ion concentration [which] is sufficient to electrolytically deposit a bronze having a copper content of greater than about 60%" as required by claim 30.

Additionally, Yanada et al. did not exemplify any plating bath having the combination of (1) a pH less than 1, (2) an aromatic, nonionic wetting agent, (3) an oxidation inhibitor, and (4) the required ratio of tin ions to copper ions sufficient to electrolytically deposit a bronze having a copper content of greater than about 60%.

In view of the foregoing, applicants submit that the disclosure of Yanada et al. does not anticipate claim 30. Accordingly, applicants request withdrawal of the §102(b) rejection.

(4) Obviousness

The disclosure of Yanada et al. does not render claim 30 obvious. According to MPEP §2141 Part II., the essential tenets for determining obviousness under the Graham v. John Deere Co. test includes the requirement that:

> (C) The references must be viewed without the benefit of impermissible hindsight vision afforded by the claimed invention; and
> *Hodosh v. Block Drug Co., Inc.*, 786 F.2d 1136, 1143 n.5, 229 USPQ 182, 187 n.5 (Fed. Cir. 1986).

As the Supreme Court recently warned in *KSR International Co. v. Teleflex, Inc.*, the factfinder "should be aware, of course, of the distortion caused by hindsight bias and must be cautious of arguments reliant upon *ex post* reasoning." Slip. op. at 17. `

The aqueous acidic electrolyte of claim 30 includes at least the combination of: (1) a pH less than 1, (2) an aromatic, nonionic wetting agent, (3) an oxidation inhibitor, and (4) a ratio of tin ions to copper ions sufficient to electrolytically deposit a bronze having a copper content of greater than about 60%. Yanada et al. do not disclose any plating bath having claim 30's combination of elements, despite including 40 Examples and 20 Comparative Examples. Accordingly, any assertion that Yanada et al.'s disclosure renders claim 30 obvious is a hindsight reconstruction using applicants' claim as a guide.

The Office's *prima facie* case of obviousness rests essentially on the single statement at [0050] of "tin-copper alloy consisting of...0.01 to 90 wt% of copper... ." But Yanada et al.'s disclosure provides ample, material teaching away from claim 30's ion ratio range such that, on balance, claim 30 is non-obvious in view of Yanada et al. In the context of obviousness of ranges, MPEP §2144.05 Part III states:

> A *prima facie* case of obviousness may also be rebutted by showing that the art, in any material respect, teaches away from the claimed invention. *In re Geisler*, 116 F.3d 1465, 1471, 43 USPQ2d 1362, 1366 (Fed. Cir. 1997)

As explained above, Yanada et al. state that their tin-copper alloys may be used as solders, which are known in the art to have low copper contents. Accordingly, the bulk of Yanada et al.'s disclosure with regard to tin ion concentration, copper ion concentration, and the copper content of the tin-copper

alloy is directed to low copper alloy. See [0016] where Yanada et al. disclose copper and tin ion concentrations for "obtaining a tin-copper alloy deposit containing 0.01-30 wt% of copper..." See also [0050] where Yanada et al. state that "for soldering or for etching resist, the content of tin should be more than 50 wt%, preferably more than 70 wt%, and more preferably more than 90 wt%." Further, Yanada et al. disclose at [0051] that "...the alloy combination of Sn and Cu is more stabilized in the Cu content range of 0.5±0.2 to 10.0±0.5 wt%..." Finally, none of Yanada et al.'s examples deposited a tin-copper alloy having more than 22 wt% copper, since each bath contained substantially more tin ions than copper ions. Taking all this into consideration, it is apparent that Yanada et al., taken as a whole, materially teach away from the claimed tin ion to copper ion ratio.

In view of the foregoing, applicants submit that Yanada et al. do not render the method of claim 30 obvious. Accordingly, applicants respectfully request withdrawal of the §103(a) rejection.

Pending claims 31-34, and 36-38 depend from claim 30 and are patentable for the same reasons as claim 30 and by virtue of the additional requirements therein.

For example, claim 32 requires a concentration of methanesulfonic acid greater than 290 g/L. Yanada et al. do not disclose this requirement. The highest concentration of methanesulfonic acid that Yanada et al. employ in their examples is only 200 g/L, which is substantially less than required by claim 32.

B. Claims 40-52

Reconsideration is requested of the rejection of claims 40-52 as being anticipated by or obvious over EP 1,001,054 (Yanada et al.).

Claim 40 is directed to an aqueous acidic electrolyte, comprising:

a) tin ions;
b) copper ions;
c) an alkylsulfonic acid; and
d) an aromatic, nonionic wetting agent; and
e) an oxidation inhibitor;
wherein the aqueous acidic electrolyte has a pH less than about 1 and a ratio of tin ion concentration to copper ion concentration is sufficient to deposit a bronze having a tin/copper ratio of about 40/60, about 20/80, or about 10/90.

The relevant disclosure of Yanada et al. is set forth in Part VI.A. of this amendment. As stated therein, Yanada et al. were concerned with depositing high tin-low copper alloys for use as solders. Accordingly, their exemplary plating baths contain a much higher concentration of tin ions than copper ions. Yanada et al.'s exemplary plating baths 8, 28, and 38 that plated relatively high copper alloys (i.e., 20%-22%) contain ***4 times*** as much tin to copper, which translates to a ratio of tin/copper ratio 80/20. In comparison, claim 40's highest tin/copper ratio is only 40/60.

Additionally, Yanada et al. do not exemplify any plating bath having the combination of (1) a pH less than 1, (2) an aromatic, nonionic wetting agent, (3) an oxidation inhibitor, and (4) a ratio of tin ion concentration to copper ion concentration sufficient to yield tin/copper alloy ratios of about 40/60, about 20/80, or about 10/90.

In view of the foregoing, applicants respectfully submit that the disclosure of Yanada et al. does not anticipate claim 40.

Moreover, for substantially the same reasons stated in Part VI.A. of this amendment, the disclosure of Yanada et al. does not render claim 40 obvious. Briefly, Yanada et al. included only a single, brief statement related to ratios of tin ion concentration to copper ion concentration for plating alloys having as much as 90 wt% copper. On balance, however, Yanada et al. materially teach away from claim 40's ratios. See Part VI.A. of this amendment. For example, all of Yanada et al.'s examples included at least four times as much tin ion as copper ion. In view thereof, any assertion that Yanada et al. disclose the claimed ratios in combination with the other claim elements is a hindsight reconstruction using applicants' claims as a guide.

In view of the foregoing, applicants submit that Yanada et al. do not render obvious the electrolyte of claim 40. Accordingly, applicants respectfully request withdrawal of the §103(a) rejection.

Pending claims 41-51 depend from claim 40 and are patentable for the same reasons as claim 40 and by virtue of the additional requirements therein.

For example, claim 43 requires a concentration of methanesulfonic acid greater than 290 g/L. Yanada et al. do not disclose this requirement. The highest concentration of methanesulfonic acid that Yanada et al. employ in their examples is only 200 g/L, which is substantially less than required by claim 43.

Claim 48 requires, in addition to the aromatic non-ionic wetting agent, a second wetting agent selected from the group consisting of an anionic wetting agent, an aliphatic, nonionic wetting agent, and combinations thereof. Yanada et al. do not disclose any embodiment that combines an aromatic non-ionic

wetting agent in combination with one or more of the wetting agents described in claim 48. Note, in particular, Examples 1, 6, 13-14, 16-19, 21, 26, 31, and 36. These plating baths contain the aromatic non-ionic wetting agent "Polyoxyethylene β-naphthol ether," but none of them further combine the wetting agent with either or both an anionic wetting agent or an aliphatic, nonionic wetting agent. In most Examples, the wetting agent is used alone. In Examples 1, 21, and 31, the wetting agent is paired with a betaine. A betaine, however, is neither an anionic wetting agent nor an aliphatic, nonionic wetting agent. Rather, a betaine is a neutral, ionic, compound comprising a positively charged functional group and a negatively charged functional group.

C. Claims 53-55

Reconsideration is requested of the rejection of claim 53-55 as being anticipated by or obvious over EP 1,001,054 (Yanada et al.).

Claim 53, like claim 40, is directed to an aqueous acid electrolyte comprising, among other components: (1) a pH less than 1, (2) an aromatic, nonionic wetting agent, (3) an oxidation inhibitor, and (4) a ratio of tin ion concentration to copper ion concentration sufficient to deposit a bronze having a tin/copper ratio of about 40/60, about 20/80, or about 10/90. Accordingly, claim 53 and claims 54-55 which depend therefrom are submitted to be patentable for the same reasons as claim 40 and by virtue of the additional requirements therein.

VII. New Claims

New claims 56-58, which depend from claim 30, are directed to particular ratios of tin ion concentration to copper ion

concentration. These claims are submitted to be patentable over Yanada et al. since Yanada et al. do not disclose and materially teach away from these ratios. See Parts VI. A. and B. of this amendment.

New claim 59, which depends from claim 30, additionally requires plating at current density of at least about 7 A/dm^2. Claim 59 is submitted to be patentable because Yanada et al. do not disclose this current density in combination with the other requirements of claim 30. Although Yanada et al. disclose broad current density ranges of 0.01-100 A/dm^2 and 0.01 to 20 A/dm^2, they disclose preferred ranges of 1-4 A/dm^2 and 0.05-5 A/dm^2. Yanada et al. disclose 13 examples with a plating rate greater than 7 A/dm^2 (Example 5, 10, 15, 20, 25, 30, 35, and 40 and Comparative Examples 3, 4, 6, 14, 16). None of these examples, however, are further combined with a method of using an aqueous acidic electrolyte having the combination of (1) a pH less than 1, (2) an aromatic, nonionic wetting agent, (3) an oxidation inhibitor, and (4) a ratio of tin ions to copper ions sufficient to electrolytically deposit a bronze having a copper content of greater than about 60%.

New claims 60-62 depend from claims 30, 40, and 53, respectively, are patentable for reasons submitted herein. Briefly, Yanada et al. did not exemplify any plating bath combining a β-naphthol ethoxylate with (1) a pH less than 1, (2) an oxidation inhibitor, and (3) the required ratio of tin ions to copper ions sufficient to electrolytically deposit a bronze having the claimed copper contents. See, in particular, Yanada et al.'s Examples 1, 6, 13-14, 16-19, 21, 26, 31, and 36.

CONCLUSION

In view of the foregoing, applicants request reconsideration and allowance of pending claims 30-34, 36-38, 40-51, and 53-59.

Respectfully submitted,

/paul fleischut/

Paul I. J. Fleischut, Reg. No. 35,513
SENNIGER POWERS
One Metropolitan Square, 16th Floor
St. Louis, Missouri 63102
(314) 231-5400

PIF/NAK/axj